II. Amendment to the Claims.

1. (Withdrawn) A continuous process for producing charcoal from biomass input material in which the production of charcoal is maximized and the consumption of charcoal is minimized, the process comprising the steps of:

a. establishing a charcoal production bed having a biomass upper layer having a top and a charcoal lower layer having a lower layer top; an intermediate layer pyrolysis zone positioned between the upper layer and the lower layer; the charcoal production bed positioned in a single reaction chamber;

b. igniting the lower layer top with ignition means;

establishing a pyrolysis zone at the intermediate layer;

c. moving oxygen-containing gas downwardly through the charcoal production bed to sustain the pyrolysis reaction in the intermediate layer and to maintain the temperature of the charcoal in the lower layer, wherein the pyrolysis volatiles from the intermediate layer move downwardly through the hot charcoal in the lower layer, resulting in tar-free fuel gas, which exits from the outlet means, and;

c. removing, by removing means, charcoal in the lower layer; regulating the introduction of additional biomass material so that as charcoal is removed, the level of charcoal comprising the lower layer, and hence the level of the pyrolysis zone comprising the intermediate layer, remain substantially constant within the reaction chamber.

2. (Withdrawn) The process of claim 1, wherein:

a. maintaining the lower layer at a temperature which is sufficiently high to reduce any tars from the pyrolysis zone intermediate layer to carbon monoxide, hydrogen;

c. providing the charcoal production bed with an outlet means for fuel gas; regulating the additional biomass material by regulating at least the quantity and or the

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moisture content of the additional biomass material.

3.(Withdrawn) The process of claim 2, including the step of monitoring the level of the pyrolysis zone in the reaction chamber.

4. (Withdrawn) The process of claim 3 wherein the monitoring of the level of the pyrolysis zone in the reaction chamber is by thermocouple means.

5.(Withdrawn) The process of claim 2, including the step of removing the fuel gas from the reaction chamber.

6.(Withdrawn) The process of claim 1, wherein the temperature of the pyrolysis reaction zone is in the range of 800.degree. C.-1000.degree.

7.(Withdrawn) The process of claim 1, wherein the charcoal lower layer is substantially devolatilized.

8.(Withdrawn) The process of claim 1, wherein the charcoal lower layer is substantially uniform in size.

9. (Withdrawn) The process of claim 2, wherein:

a. establishing the charcoal production bed is commenced by adding a charge of charcoal at the lower layer of the reaction chamber.

10. (Cancelled)

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11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Currently amended) An apparatus to produce fuel gas from biomass, comprising:

a single reaction chamber comprising a charcoal production bed and a delivery means wherein said delivery means is functionally connected to a source of raw, unprocessed biomass; and further wherein said charcoal bed comprises three vertically identifiable layers – an uppermost layer of raw, unprocessed biomass; an intermediate layer comprising a pyrolysis zone; and a lowermost layer of charcoal, said charcoal comprising spent biomass;

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a charcoal removal system comprising a mechanical conveyance means, comprising an independent motor and temperature-activated control mean, functionally connected to said single reaction chamber;

said apparatus to produce fuel gas from biomass further comprising a filter wherein said filter is functionally and physically connected to said single reaction chamber by pipe gas exit means, and said filter further being functionally connected to a heat exchanger by pipes, said heat exchanger comprising a heat exchanger tank, a coolant fluid, coolant fluid inlet and a coolant fluid discharge, wherein, said heat exchanger discharge physically joins said heat exchanger tank to a demister element, said demister element comprising a demister tank and demister input, said demister input comprising at least one tube and a condensate drain, and further comprising a demister element output pipe, said demister element output pipe being functionally and physically connected to a fuel conditioner element;

said fuel conditioner element comprising a tank element, a bubble forming element positioned near the bottom of said tank element, a fuel fluid, and a fuel conditioning means discharge pipe;

and, said apparatus to produce fuel gas from biomass further comprising a pump means positioned on said apparatus to produce fuel gas from biomass, such that the flow of air is vertically downward from the top of said reaction chamber with a controlled flow volume and such that said pump generates a pressure differential so that fuel gas flows from said intermediate layer through said filter, said heat exchanger means, said demister, and said fuel conditioner to said initial storage point;

the said coolant fluid from the group of water, a mixture of water and any antifreeze fluid and a mixture of water and an alcohol.

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~~The [the] apparatus to [ro] produce fuel gas from biomass of claim 22 wherein a [said] fuel means is diesel fuel.~~

27. (Currently amended) The apparatus of Claim 26 further comprising:

~~the apparatus to produce fuel gas from biomass of claim 22 wherein said fuel means is any combustible vegetable oil.~~

the fuel fluid is from the group consisting of diesel fuel, combustible vegetable oil and combustible liquid fossil fuel.

28. (Cancelled)

Claim 29 (New) An apparatus for the production of fuel gas and charcoal comprising:

a generally cylindrical reaction chamber (30) having an open top and containing a production bed (10), said production bed (10) comprising an upper layer (1 3) containing biomass input material, an intermediate layer (14) containing biomass that has been reduced to char and fuel gas (44) by pyrolysis, and a lower layer (15) containing biomass that has been further reduced to charcoal;

a delivery means (16) for supplying biomass to the upper layer (13) of the production bed (10);

a removal means (45) for removing charcoal from the lower layer (1 5) of the production bed (10);

a light detection means (22) mounted at the top (31) of the reaction chamber (30) for detecting the presence of biomass in the reaction chamber (30) and for signaling the

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supply of additional biomass to the upper layer (1 3) of the production bed (10) via said delivery means (16);

a temperature sensing means comprising at least one thermocouple positioned within the reaction chamber (30) for sensing the temperature of the production bed (10), said temperature sensing means further signaling the supply of additional biomass to the upper layer (13) of the production bed (10) via said delivery means (16) and the removal of charcoal from the lower layer (15) of the production bed (10) via said removal means (45);

an outlet means (43) for removing fuel gas (44) from the reaction chamber (30), said outlet means (43) being located on the reaction chamber (30) adjacent to the intermediate layer (14) of the production bed (10), said outlet means (43) being connected to a pump (42) for drawing atmospheric air through the open top of the reaction chamber (30), through the production bed (10), and into the outlet means (43);

a heat exchanger means (60) connected to said outlet means (43), said heat exchanger means (60) comprising a heat exchanger tank containing a water or coolant reservoir (65) for cooling the fuel gas (44), and said tank further comprising a heat exchanger exhaust (71) for discharging the cooled fuel gas (44);

a demister means (80) connected to the heat exchanger exhaust (71), said demister means (80) comprising a demister tank for collecting a condensate (83), at least one tube (81) for directing the cooled fuel gas (44) from the heat exchanger exhaust (71) into the demister tank, and a demister exhaust (82) for discharging the demisted and cooled fuel gas (44) from the demister tank;

a fuel conditioner means (100) connected to the demister exhaust (82), said fuel conditioner means (100) comprising a fuel conditioner tank containing a fuel means (120), a bubble forming means (115) for bubbling the demisted and cooled fuel gas (44)

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from the demister exhaust (82) into the fuel means (120), and a fuel conditioner exhaust for discharging the conditioned, demisted and cooled fuel gas (44) to a pump means (140);

and a storage or engine means (160) connected to the fuel conditioner exhaust via said pump means (140) for collecting or combusting the conditioned, demisted and cooled fuel gas (44).

Claim 30 (New) The apparatus of claim 29, wherein,

the heat exchanger tank comprises a water or coolant inlet (67) and a water or coolant outlet (69), and the fuel gas (44) is bubbled through the water or coolant reservoir (65) and exhausted from the heat exchanger tank through the heat exchanger exhaust (71);

the at least one tube (81) of the demister means (80) extends downwardly toward the condensate (83) in a demister tank;

the bubble forming means (115) of the fuel conditioner means (100) is submerged beneath the surface of the fuel means (120) in the fuel conditioner tank, said bubble forming means comprising a pipe or tube means (110) that extends through a grid (116) formed of a wire mesh or plate containing at least one aperture (117);

the delivery means (16) comprises at least one device selected from the group consisting of hoppers, conveyors and augers;

the light detection means (22) comprises an electric eye, wherein the electric eye provides a switch function that electrically communicates with a motor drive for the delivery means (16), the motor drive being powered during a detected absence of biomass in the reaction chamber (30); and

the temperature sensing means comprises at least one thermocouple located at the

upper layer (13) of the production bed (10).

Claim 31 (New) The apparatus of claim 30, wherein,

the heat exchanger means (60) further comprises a supplemental heat exchanger means (62) positioned within the heat exchanger tank and in fluid contact with the water or coolant reservoir (65);

the at least one tube (8 1) of the demister means (80) comprises a plurality of tubes, the demister means (80) further comprising a condensate drain means (84) comprising a valve and piping means for discharging the condensate (83) into a reservoir; and the delivery means (16) comprises a motor controlled auger.

Claim 32 (New) The apparatus of claim 31, further comprising:

valve means for controlling the supply of water or coolant to the inlet (67) and the discharge of water or coolant from the outlet (69);

wherein,

the supplemental heat exchanger means (62) comprises a tube heat exchanger; the fuel means (120) comprises at least one combustible substance selected from the group consisting of diesel, peanut oil and vegetable oil; and

the temperature sensing means comprises three thermocouples positioned respectively in the upper layer (13) of the production bed (10), the intermediate layer (14) of the production bed (10), and at the delivery means (16).

Claim 33 (New) The apparatus of claim 32, wherein,

the conditioned, demisted and cooled fuel gas (44) is introduced directly into the intake manifold of the engine means (160);

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the removal means (45) comprises a device selected from the group consisting of an auger, a valve controlled chute and a screw drive; and

the thermocouple positioned in the intermediate layer (14) of the production bed (10) signals the removal means (45) to move the intermediate layer (14) of the production bed down the reaction chamber (30); the thermocouple positioned in the upper layer (13) of the production bed (10) signals the safety shutdown of pump (42); and the thermocouple positioned at the delivery means (16) signals additional safety control of pump (42).

Claim 34 (New) The apparatus of claim 30, further comprising:

a reservoir collecting the water or coolant discharged from the heat exchanger means (60) via the water or coolant outlet (69) for subsequent agricultural use;

wherein,

the removal means (45) comprises a device selected from the group consisting of an auger, a valve controlled chute, a screw device and a lift or moving device, the removal means (45) further comprising a conveyance or routing means (34) and a charcoal storage means (36); and

the reaction chamber (30) is composed of heat and corrosion resistant materials including fiberceramic insulation and/or a stainless steel liner.

Claim 35 (New) The apparatus of claim 29, further comprising:

a funnel means (200) positioned at the top of the reaction chamber (30) for directing biomass to the center of the upper layer (12) of the production bed (10); and

a charcoal discharge funnel means (230) positioned between the lower layer (15) of the production bed (10) and the removal means (45), for directing charcoal away from

the walls of the reaction chamber (30) and toward the removal means (45);

wherein the funnel means (200) and the charcoal discharge funnel means (230) are sloped, relative to vertical, at an angle greater than approximately 45 degrees.

Claim 36 (New) The apparatus of claim 35, wherein,

the funnel means (200) and the charcoal discharge funnel means (230) are sloped, relative to vertical, at an angle of approximately 60 degrees; and

the removal means (45) comprises a device selected from the group consisting of an auger, a valve controlled chute, a screw drive and a lift or moving device, said removal means (45) further comprising conveyance or routing means (34) and a charcoal storage means (36).

Claim 37 (New) The apparatus of claim 3 1, further comprising:

a charcoal collection means (41) and a charcoal heat exchanger means (260) comprising at least one tube (262) that penetrates the wall (42) of the charcoal collection means (41) via a plurality of heat exchanger ports (264);

wherein,

the uppermost portion of the reaction chamber (30) is slightly flared to accommodate a head of the biomass; and

the reaction chamber (30) is composed of heat and corrosion resistant materials including fiber ceramic insulation and/or a stainless steel liner.

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